

Preventable Hospitalizations in Primary Care Shortage Areas

An Analysis of Vulnerable Medicare Beneficiaries

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Background: Health care outcomes among vulnerable elderly populations (defined in this study as Medicare beneficiaries who rated their overall general health as “fair” or “poor”) are a growing concern. Recent studies suggest that potentially preventable hospitalizations may be useful for identifying poor ambulatory health care outcomes among vulnerable populations.

Objective: To determine if Medicare beneficiaries in fair or poor health are at increased risk of experiencing a preventable hospitalization if they reside in primary care health professional shortage areas.

Design: A survey of Medicare beneficiaries from the 1991 Medicare Current Beneficiary Survey.

Patients: Medicare beneficiaries living in the community.

Results: Medicare beneficiaries in fair or poor health were 1.82 times more likely to experience a preventable

hospitalization if they resided in a primary care shortage area (95% confidence interval, 1.18-2.81). After controlling for educational level, income, and supplemental insurance, Medicare beneficiaries in fair or poor health were 1.70 times more likely to experience a preventable hospitalization if they resided in a primary care shortage area (95% confidence interval, 1.09-2.65).

Conclusions: Medicare beneficiaries in fair or poor health are more likely to experience a potentially preventable hospitalization if they live in a county designated as a primary care shortage area. Provision of Medicare coverage alone may not be enough to prevent poor ambulatory health care outcomes such as preventable hospitalizations. Improving health care outcomes for vulnerable elderly patients may require structural changes to the primary care ambulatory delivery system in the United States, especially in designated shortage areas.

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HEALTH OUTCOMES among vulnerable elderly populations are a growing concern among health policy planners in the United States.^{1,2} Inequitable distribution of health care providers, especially physicians, is often cited as a potential barrier to health care access that might affect health care outcomes.³⁻⁶ Although many studies⁷⁻¹² have documented the unequal distribution of providers across geographic areas, few studies examine the effect of this uneven distribution on ambulatory health care outcomes, especially among elderly patients.

of the demand for physician services.¹³ This approach identifies areas with potentially inadequate physician supply based on a structural measure, the physician-population ratio, rather than process measures or outcomes of care. This ratio is based on assumptions about the demand on medical services generated by a given population. It is estimated that 1 full-time primary care provider can adequately provide services to 2500 people. In an attempt to move away from demand-based models of measuring physician supply, some policy makers have recommended that efforts at identifying inadequate access to health care services should be redirected toward the use of epidemiological methods to determine the effectiveness of the service.^{14,15}

A number of recent studies¹⁵⁻²² have suggested that a subset of hospitalizations may be prevented by adequate and timely ambulatory care. This set of conditions, referred to as ambulatory care-sensitive con-

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The approach for documenting adequate health professional supply in a geographic area (health professional shortage area designation) is based on estimates

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PATIENTS AND METHODS

DATA SOURCE

The data for this analysis were obtained from the Medicare Current Beneficiary Survey (MCBS) conducted in 1991. The MCBS is a multipurpose, longitudinal, panel survey of a representative sample of the Medicare population and is sponsored by the Health Care Financing Association.²⁵ A multistage sampling design was used with the MCBS; 107 primary sampling units were selected, from which 1163 geographic clusters were chosen, followed by systematic sampling by age strata based on the 5% Health Care Financing Association enrollment file. Computer-assisted personal interviewing was used in community interviews that last about 1 hour. The MCBS provides a profile of the Medicare population with respect to an individual's use of health services, medical care expenditures, health insurance coverage, health status, and sociodemographic characteristics.

VULNERABLE MEDICARE BENEFICIARIES

To examine preventable hospitalizations among elderly patients in primary care shortage areas, we identify Medicare beneficiaries in fair or poor health from the 1991 MCBS. We restrict our analysis to Medicare beneficiaries in fair or poor health because we expect that this group of individuals will be particularly vulnerable to access problems, especially in primary care shortage areas.^{1,23} This vulnerability to access barriers should result in a higher likelihood of hospitalization as a result of a lack of timely ambulatory care.

Beneficiaries who reside in a facility such as a nursing home were excluded. These individuals are substantially more likely to have access to health professionals within those settings; and access barriers, such as transportation, distance to the physician, or availability of appointments in shortage areas, should not be a problem.

IDENTIFYING PREVENTABLE HOSPITALIZATIONS

Medicare administrative claims data on inpatient utilization were used to identify respondents who had a hospitalization during the study period and to determine which, if any, of the hospitalizations were preventable. We adopted the definition for 14 acute and chronic conditions following the work of Weissman et al,¹⁷ Billings et al,^{16,20} and the Institutes of Medicine.^{18,19,21} **Table 1** indicates the *International Classification of Diseases, Ninth Revision*,²⁶ codes used to identify a potential preventable hospitalization if the code was reported as the first or primary diagnosis for any hospitalization. We only included an *International Classification of Diseases, Ninth Revision*, code in our search criteria if that code had been used in all 3 of the previously mentioned study groups. Each Medicare beneficiary

was classified into 1 of 2 groups; 1 group of beneficiaries had experienced at least 1 potentially preventable hospitalization and 1 group had not.

SHORTAGE AREA DESIGNATION

Since 1980, the Bureau of Health Professions has classified counties into 1 of 3 groups: no area within the county is designated as a shortage area, the entire county is designated as a shortage area (whole county shortage areas), or 1 or more parts of the county are designated as a shortage area (partial county shortage areas). Geographic identifiers for each Medicare beneficiary surveyed on the MCBS were obtained from the Health Care Financing Association. Using these codes and the 1991 primary care health professional shortage area designation from the *Federal Register*,²⁷ we classified each Medicare beneficiary as residing in a "whole" county shortage area, residing in a "partial" county shortage area, or not residing in a shortage area.

We were unable to determine if beneficiaries living in partial county shortage areas actually resided in a shortage area within that county. To avoid a misclassification error, we excluded beneficiaries who reside in partial county shortage areas from this analysis. Thus, we compared beneficiaries in fair or poor health who resided in counties where the entire county was designated as a shortage area with those in fair or poor health who resided in counties where no area within the county had a shortage area designation.

ANALYTIC METHOD

First, we examined the individual characteristics of Medicare beneficiaries across shortage areas to determine if other factors besides residing in a primary care shortage area might be related to preventable hospitalizations. Next, we examined the distribution of preventable hospitalizations by health status. Then we determined if beneficiaries with fair or poor health status were more likely to experience a preventable hospitalization if they lived in a primary care shortage area. Finally, to determine the independent relation between residing in a primary care shortage area and a preventable hospitalization, we used a multivariate logistic regression analysis to control for individual characteristics of each beneficiary that might explain a preventable hospitalization, including income, race, sex, educational level, and insurance status. To aid in interpreting the logistic regression results, we calculated the odds ratios for each variable.

Analyses were conducted using the statistical package SUDAAN²⁸ because of the complex multistage sampling design of the MCBS. This software produces appropriate SEs in surveys involving cluster sampling. Weights provided on the public use tapes were also used to adjust for oversampling and nonresponse bias. The results provide national estimates for the Medicare population.

ditions, avoidable hospitalizations, or, more recently, preventable hospitalizations, may be useful in identifying poor ambulatory health care outcomes among vulnerable populations as a result of inadequate access to ambulatory care. The rationale behind using this ambulatory outcome measure as an indicator of health care access is that timely and effective ambulatory care may reduce the risk of hospital-

ization for selected medical conditions by preventing the onset of the disease, controlling an acute episodic illness or condition, or managing the chronic disease or condition in such a way as to prevent progression of the disease to a state requiring hospitalization.

Ambulatory health care outcomes in primary care shortage areas are a particular concern for vulnerable

Table 1. Preventable Hospital Conditions*

Diagnostic Group	ICD-9 Codes
Asthma	493, 493.0, 493.01, 493.1, 493.2, 493.9
Cellulitis	263, 264, 681, 682, 682.0-682.9, 683, 686
Dehydration	276.5
Gastroenteritis	558.9
Hypoglycemia	251.2
Kidney or UTI	590, 590.2, 590.9, 590.11, 599.0, 599.9
Pneumonia	481, 482.2, 482.3, 482.9, 483, 483.0, 485, 486
Severe ENT infection	382, 382.1-382.9, 382.00-382.02, 462, 463, 464, 465, 472.1
Angina	411.1, 411.8, 413
COPD	466, 491, 491.1, 491.20, 491.21, 491.8, 492, 492.0, 492.8, 494, 496
CHF	402.01, 402.11, 402.91, 428, 428.0, 428.1, 428.9, 518.4
Diabetes	250.0-250.3, 250.8-250.10, 250.12, 250.13, 250.20, 250.22, 250.23, 250.30, 250.32, 250.33, 250.90, 250.92, 250.93
Epilepsy	345.0-345.9, 780.3
Hypertension	401.0, 401.9, 402.00, 402.10, 402.90

*ICD-9 indicates International Classification of Diseases, Ninth Revision; UTI, urinary tract infection; ENT, ears, nose, and throat; COPD, chronic obstructive pulmonary disease; and CHF, congestive heart failure.

groups of the elderly who may be disproportionately affected by barriers to access, such as financial limitations or physician unavailability.¹ Miller²³ found that among Medicare beneficiaries in poor health or with limited physical activity, those without supplemental insurance coverage or with lower incomes had 15% to 32% fewer ambulatory care visits. Gornick and colleagues²⁴ found that black and low-income beneficiaries have patterns of use that suggest they may be receiving less primary and preventive care.

The purpose of this article was to determine if living in an area of low physician supply as indicated by a primary care shortage area designation is associated with an increased risk of a preventable hospitalization among Medicare beneficiaries in fair or poor health. This analysis is unique in that, to our knowledge, it is the first such analysis to examine preventable hospitalizations and physician supply at the level of the individual patient rather than examining rates of hospitalizations across small geographic areas. It is also the first analysis to focus exclusively on elderly patients. Earlier studies of preventable or avoidable hospitalizations explicitly excluded the elderly because it was believed that enrollment in the Medicare program assured adequate ambulatory health care access.

RESULTS

The 1991 MCBS completed surveys of 12 677 respondents (response rate, 87.0%). After excluding those who resided in a facility (n = 2962) or a partial county primary care shortage area (n = 5583), the sample numbered 4132. We defined our vulnerable Medicare population as those who rated their overall general health as "fair" or "poor." This left a final sample of 2763 Medicare beneficiaries. A total of 299 (10.8%) of the 2763 Medicare beneficiaries who indicated that their health

Table 2. Characteristics of Medicare Beneficiaries With Fair or Poor Health by Shortage Area Status

Characteristic	Shortage Area Status*	
	Whole County	Non-HPSA
Portion of the sample	17.3	82.7
Preventable hospitalizations†	16.5	9.8
Age, mean, y	76.1	76.2
Completed high school†	17.5	38.2
Income <\$10 000/y†	58.8	39.7
Medicare only†	25.3	12.6
Medicare plus private insurance	48.5	74.2
Medicare plus Medicaid†	26.3	13.2
Poor health†	36.1	29.2

*Data are given as percentage of beneficiaries, unless otherwise indicated. HPSA indicates health professional shortage area.

†The difference across groups is significant (P < .01).

Table 3. Health Status and Preventable Hospitalizations*

Health Status	No Preventable Hospitalizations	At Least 1 Preventable Hospitalization
Excellent	1658 (98.0)	33 (2.0)
Very good	2287 (97.5)	58 (2.5)
Good	2751 (95.0)	145 (5.0)
Fair	1777 (92.1)	152 (7.9)
Poor	687 (82.4)	147 (17.6)

*Data are given as number (percentage) of patients ($\chi^2 = 33.95$, P < .001).

status was fair or poor experienced at least 1 preventable hospitalization during 1991.

Simple descriptive data on Medicare beneficiaries who are in fair or poor health by shortage area status of their county of residence are reported in **Table 2**. Compared with Medicare beneficiaries who reside in counties that are not shortage areas, those who live in "whole county" primary care shortage areas are significantly more likely to be in poor health, have no supplemental health insurance or Medicaid supplemental insurance, and have a lower income and are less likely to have finished high school.

To illustrate the relationship between health status and preventable hospitalizations, **Table 3** displays the distribution of preventable hospitalizations by health status for the entire MCBS sample who did not reside in a facility (n = 9695). Those in fair or poor health have higher rates of preventable hospitalizations compared with those in better health. In particular, those in poor health were 8 times more likely to experience a preventable hospitalization compared with those in excellent health.

To examine the relation between living in a primary care shortage area and experiencing a preventable hospitalization among beneficiaries in fair or poor health, we used a χ^2 test. Those in fair or poor health were 1.82 times more likely to experience a preventable hospitalization if they lived in a primary care shortage area ($\chi^2 = 7.42$, P < .01, 95% confidence interval, 1.18-2.81).

In the construction of the multivariate logistic regression analysis, the dependent variable was coded as "1" if the patient experienced at least 1 preventable hos-

Table 4. Definition of Independent Variables

Variable	Definition
Age ≥ 75 y	A dummy variable set equal to 1 if the age of the respondent was ≥ 75 y
Male	A dummy variable set equal to 1 if the respondent was male
Nonwhite	A dummy variable set equal to 1 if the respondent's race was not white
Education more than high school	A dummy variable set equal to 1 if the respondent's highest level of educational attainment was ≥ 13 y of schooling
Married	A dummy variable set equal to 1 if the respondent reported marital status as "married"
Annual income* <\$10 000	A dummy variable set equal to 1 if the respondent's family income was <\$10 000 per year
\$10 000-\$20 000	A dummy variable set equal to 1 if the respondent's family income was \$10 000-\$20 000 per year
Medicare or Medicaid only†	A dummy variable set equal to 1 if the respondent's insurance coverage included only Medicare and Medicaid
Primary care shortage area	A dummy variable set equal to 1 if the respondent lived in a county where the entire county was designated as a health professional shortage area

*The omitted or reference category is respondents with an annual family income higher than \$20 000.

†The omitted or reference category is respondents who had private or public health insurance or no supplemental insurance.

pitalization during 1991 and "0" if the patient did not. The independent variables are defined in **Table 4**. The odds ratios calculated from the results of the multivariate logistic regression analysis for Medicare beneficiaries in fair or poor health are reported in **Table 5**. These results indicate that Medicare beneficiaries in fair or poor health who lived in primary care shortage areas were significantly more likely to experience a preventable hospitalization after controlling for age, sex, race, marital status, income, educational level, and supplemental Medicaid coverage.

COMMENT

Medicare beneficiaries in fair to poor health who reside in whole county primary care shortage areas are significantly more likely to experience a potentially preventable hospitalization. Our findings indicate that living in a primary care shortage area is an independent risk factor for a preventable hospitalization, even after controlling for other factors associated with health care use, such as income, age, and race.

These results are consistent with other studies²⁹⁻³¹ that have found a relation between primary care provider availability and health care outcomes. Farmer et al²⁹ found that, after controlling for educational level, poverty, race, and rural status across 393 US county groups, the number of primary care providers per 1000 people was significantly related to age-specific mortality. Shi³⁰ found that the number of primary care providers per 10 000 people was significantly associated with higher

Table 5. Regression Analysis: Characteristics of Medicare Beneficiaries in Fair or Poor Health With a Preventable Hospitalization*

Characteristic	Odds Ratio (95% Confidence Interval)
Age >75 y?	1.25 (0.96-1.64)
Male?†	1.31 (1.03-1.68)
Race nonwhite?	0.95 (0.67-1.33)
Education more than high school?	0.77 (0.53-1.13)
Married?	0.85 (0.63-1.14)
Income <\$10 000/y?	0.91 (0.70-1.20)
Medicare plus Medicaid?	1.18 (0.90-1.54)
Primary care shortage area?‡	1.70 (1.09-2.65)

*The dependent variable was a preventable hospitalization (1 indicates yes; 0, no).

†P = .03.

‡P = .02.

life expectancy and lower rates of infant mortality, neonatal mortality, low birth weight, deaths due to cancer, and heart disease. The data presented in this study suggest that individual Medicare beneficiaries who reside in primary care shortage areas are at risk for adverse ambulatory health outcomes, especially those in poor health.

There are several limitations to this study. First, the designation of a county as a primary care shortage area may be dependent on how aggressive the state or county is in pursuing that designation. This process can be resource intensive, and it is possible that some counties may meet the criteria and not have a health professional shortage area designation. If so, our analysis may have underestimated the relation between residing in a health professional shortage area and preventable hospitalization.

Second, it is possible that regional variation in physician decision making to admit a patient may explain a preventable hospitalization more than the supply of physicians in a given area.³² However, Green and Becker³³ found no differences in decision making by physicians to admit patients with chest pain. Perhaps more relevant to our analysis, Bindman and colleagues¹⁹ found that, although there was variation in physician practice styles across geographic areas, the variation in practice styles did not explain the observed variation in preventable hospitalization rates across those same areas.

It is also possible that some preventable hospitalizations may not have been truly "preventable" with adequate and timely ambulatory care. Although widely used as a measure of ambulatory access, there are few studies that attempt to validate the preventable hospitalization as a measure of ambulatory access. Three possible scenarios exist, from the perspective of the patient, that would lead to a preventable hospitalization. First, some of these individuals may have received excellent care in the ambulatory care setting in the days or weeks before hospitalization, but their underlying health was so poor that they required a hospital admission to manage their illness. Second, some may have had excellent "potential" access, but they delayed seeking care to the point at which hospitalization was required. Finally, some may have poor access to care for reasons other than physician availabil-

ity, such as financial, transportation, or other reasons, and due to their inability to obtain health care when they thought they needed it, they ended up in the hospital.

Our study is also limited in its ability to generalize these findings outside the group of elderly patients who are in fair or poor health. This raises the issue of the meaning of a primary care shortage area designation. As previously mentioned, these designations are often driven by political processes. It is possible that many of these areas may no longer lack adequate primary care services. It is possible that a primary care shortage area designation may be a proxy for a population that has a lower socioeconomic status and is therefore more likely to experience the advanced morbidity and mortality common among lower socioeconomic groups for reasons that are still not clear.

In conclusion, this study indicates that Medicare beneficiaries in fair to poor health are at significantly increased risk of a preventable hospitalization if they live in a county designated as a primary care shortage area, independent of other factors such as income or supplemental health insurance. Efforts to address adequate access to ambulatory care for vulnerable elderly populations in the United States should take into account the increased cost of hospital use in the Medicare population associated with poor ambulatory care outcomes in counties designated as primary care shortage areas.

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Clinical Pearl

Estrogens Help the Mouth

Postmenopausal estrogen was associated with lower rates of tooth loss and edentia, with the effect more obvious with longer duration of use. (*Arch Intern Med.* 1995;155:2325-2329.)